We claim:

1. A composition for controlled temperature induction heating comprising at least one matrix material and ferromagnetic hexagonal ferrite particles, and wherein the particles have a specific Curie temperature (T_c) in the matrix material.

2. The composition of claim 1, wherein the ferromagnetic hexagonal ferrite particles comprise SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO:2Me_aO:8Fe_2O_3$, 2Y is $2(BaO:Me_aO:Fe_2O_3)$, and 2Z is $3BaO:2Me_aO:12Fe_2O_3$, and wherein Me_a is a divalent cation.

3. The composition of claim 2, wherein the divalent cation is selected from Mg, Co, Mn and Zn.

4. The composition of claim 2, wherein the ferromagnetic hexagonal ferrite particles have the $SrFe_{12}O_{19}$, Co-2Y, Mg-2Y, Zn/Co-2Y, or Zn/Mg-2Y or combinations thereof.

5. The composition of claim 1, wherein the particles are on a surface of the matrix material.

6. The composition of claim 1, wherein the particles are embedded in the matrix material.

7. The composition of claim 1, wherein the Curie temperature is from about 100° to 450 °C.

8. The composition of claim 1, wherein the particles are from about 1 micron to about 840 microns.

9. The composition of claim 1, wherein the particles are less than 1 micron.

10. The composition of claim 1, wherein the particles are present from about 1% to about 50% by volume.

11. The composition of claim 11, wherein the particles are from about 10% to about 30% by volume.

12. The composition of claim 11, wherein the particles are present from about 15% to about 20% by volume.

13. The composition of claim 1, wherein the matrix material comprises a thermoplastic material.

14. The composition of claim 13, wherein the thermoplastic material comprises PEEK, PEKK, PEI, PPS, PSU, PET, polyester, PA, PP, PP/MXD6, PP/EVOH, PE, PU, PPO, PC or combinations thereof.

15. The composition of claim 1, wherein T_c of the particles is less than the melting temperature of the matrix material.

16. The composition of claim 1, wherein T_c of the particles is greater than the melting temperature of the matrix material.

17. A composition for controlled temperature induction comprising a matrix material and magnetically soft ferrite particles, wherein the particles have a specific Curie temperature (T_c) in the matrix material.

18. The composition of claim 17, wherein the particles have the composition $1Me_bO:1Fe_2O_3$, where Me_bO is a transition metal oxide.

19. The composition of claim 18, wherein the Me_b is selected from Ni, Co, Mn, and Zn.

20. The composition of claim 18, wherein the matrix material comprises a thermoplastic material.

21. The composition of claim 20, wherein the thermoplastic material comprises PEEK, PEKK, PEI, PPS, PSU, PET, polyester, PA, PP, PP, PE, PU, PPO, PC or combinations thereof.

22. The composition of claim 17, wherein T_c of the particles is less than the melting temperature of the matrix material.

23. The composition of claim 17, wherein T_c of the particles is greater than the melting temperature of the matrix material.

24. The composition of claim 17, wherein the particles are selected from (Mn, ZnO) Fe_2O_3 and (Ni, ZnO)Fe_2O_3.

25. A method of controlled temperature heating of a thermoplastic material comprising

(a) providing ferromagnetic, hexagonal ferrite particles having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO:2Me_aO:8Fe_2O_3$, 2Y is $2(BaO:Me_aO:Fe_2O_3)$, and 2Z is $3BaO:2Me_aO:12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO:1Fe_2O_3$, where Me_bO is a transition metal oxide, in a first thermoplastic material, wherein the particles in a first thermoplastic material, wherein the particles have a specific Curie temperature (T_c) in the first thermoplastic material,

(b) applying an alternating magnetic field to the first thermoplastic material to heat the magnetic particles, and

(c) ceasing heating of magnetic particles when the magnetic particles reach Curie temperature.

26. The composition of claim 25, wherein the Me_a comprises Mg, Co, Mn or Zn and Me_b comprises Ni, Co, Mn, or Zn.

27. The composition of claim 25, wherein the particles comprise SrF, Co-2Y, Mg-2Y, Zn/Co-2Y, or Zn/Mg-2Y or combinations thereof, (Mn, ZnO)Fe_2O_3 or (Ni, ZnO)Fe_2O_3.

28. The method of claim 25, wherein T_c of the particles is less than the melting temperature of the thermoplastic material.

29. The method of claim 25, wherein T_c of the particles is greater than the melting temperature of the thermoplastic material, and the magnetic field is applied so that the magnetic particles melt the first thermoplastic material.

30. The method of claim 26, further comprising the step of providing a second thermoplastic material in contact with the first thermoplastic material before applying the alternating magnetic field.

31. The method of claim 25, further comprising initially placing the first thermoplastic material on an uncured or partially cured thermoset material and bonding the thermoplastic material and the thermoset material while curing the thermoset material.

32. The method of claim 31, further comprising initially juxtaposing the first thermoplastic material on the thermoset material, bonding the thermoplastic to the thermoset while curing the thermoset material, and juxtaposing the bonded assembly with the second material.

33. The method of claim 32, wherein the second material is a second thermoset material with a second thermoplastic material and wherein the bonding comprises flowing and bonding the first and second thermoplastic materials while curing the thermoset material.

34. The method of claim 30, wherein the second material is a second thermoplastic material.

35. The method of claim 34, where the second material has a different chemical composition than the first thermoplastic material.

36. The method of claim 34, wherein the second thermoplastic material has magnetic particles embedded therein.

37. The method of claim 36, wherein the particles are embedded in adjacent surfaces of the first and second thermoplastic materials.

38. The method of claim 36, wherein the particles are embedded in a surface of the first or second thermoplastic material.

39. The method of claim 25, wherein the particles are from about 1 micron to about 840 microns.

40. The method of claim 25, wherein the particles are less than 1 micron.

41. The method of claim 25, wherein the applying comprises applying an alternating magnetic field at about 500 KHz - 10 MHz.

42. The method of claim 25, wherein the applying comprises applying an alternating magnetic field at about 500 KHZ to 2 MHZ.

43. The method of claim 25, wherein the applying comprises applying an alternating magnetic field at about 2 MHZ to 10 MHZ.

44. The method of claim 25, further comprising varying the amount of zinc in the Zn/Mg-2Y or the Zn/Co-2Y particles to control the Curie temperature of the particles.

45. The method of claim 25, further comprising aligning dipoles of the ferromagnetic particles before applying the alternating magnetic field.

46. The method of claim 45, wherein applying an alternating magnetic field comprises applying a field oriented in the same direction as the dipoles of the ferromagnetic particles.

47. A method for preparing a material for controlled temperature heating of a material containing ferromagnetic particles which have magnetic dipoles, the method comprising aligning the dipoles of the ferromagnetic particles prior to heating the material.

48. The method according to claim 47, wherein the step of aligning the dipoles of the ferromagnetic particles comprises applying a first magnetic field to align the dipoles parallel to the first magnetic field.

49. The method according to claim 47, wherein the step of heating the material comprises applying a second magnetic field oriented in the same direction as the dipoles of the ferromagnetic particles.

50. The method according to claim 47, wherein the ferromagnetic particles comprise hexagonal ferrites having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide.

51. The composition of claim 48, wherein the Me_a comprises Mg, Co, Mn or Zn and Me_b comprises Ni, Co, Mn, or Zn.

52. The composition of claim 47, wherein the particles comprise SrF, Co-2Y, Mg-2Y, Zn/Co-2Y, or Zn/Mg-2Y or combinations thereof, (Mn, ZnO)Fe_2O_3 or (Ni, ZnO)Fe_2O_3.

53. An apparatus for heating a thermoplastic material comprising ferromagnetic, hexagonal ferrite particles having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is BaO:2Me_aO:8Fe_2O_3, 2Y is 2(BaO:Me_aO:Fe_2O_3), and 2Z is 3BaO:2Me_aO:12Fe_2O_3, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition 1Me_bO:1Fe_2O_3, where Me_bO is a transition metal oxide, wherein the particles have a specific Curie temperature (T_c), and wherein the particles are in contact with the thermoplastic material; an inductor for heating the particles to their Curie temperature, and a power source connected to the inductor.

54. The apparatus of claim 53, wherein the particles are from about 1 micron to about 840 microns.

55. The apparatus of claim 53, wherein the particles are less than 1 micron.

56. The apparatus of claim 53, wherein the power source provides an alternating field of from about 500 KHz to about 10 MHz to the inductor, and wherein the frequency of the field is selected to optimize the efficiency and rate of heating during the bonding or curing process.

57. The apparatus of claim 53, wherein T_c of the particles is less than the melting temperature of the thermoplastic material.

58. The apparatus of claim 53, wherein T_c of the particles is greater than the melting temperature of the thermoplastic material.

59. The apparatus of claim 53, wherein Me_a comprises Mg, Co, Mn or Zn and Me_b comprises Ni, Co, Mn, or Zn.

60. The apparatus of claim 53, wherein the particles comprise SrF, Co-2Y, Mg-2Y, Zn/Co-2Y, or Zn/Mg-2Y or combinations thereof, (Mn, ZnO)Fe_2O_3 or (Ni, ZnO)Fe_2O_3.

61. The apparatus of claim 53, wherein the thermoplastic material comprises a shaped polymeric material.

62. The apparatus of claim 61, further comprising a layer of distinct material laminated to the shaped polymeric material.

63. The apparatus of claim 53, wherein the thermoplastic material comprises PEEK, PEKK, PEI, PPS, PSU, PET, polyester, PA, PP, PE, PU, PPO, PC or combinations thereof.

64. The apparatus of claim 61, wherein the polymeric material is shaped by extrusion or compression molding or by a film casting process.

65. The apparatus according to claim 53, wherein the ferromagnetic particles are embedded in the surface of the thermoplastic material.

66. The apparatus according to claim 53, wherein the ferromagnetic particles are dispersed throughout the thermoplastic material.

67. The apparatus according to claim 53, wherein the inductor operates at a power between 1500 W-2300W.

68. The apparatus according to claim 53, wherein the inductor has a frequency of 88 kHz – 310 kHz.

69. A method of controlling the temperature of a polymeric material comprising

(a) providing at least one polymeric material,

(b) heating the polymeric material,

(c) dispersing ferromagnetic hexagonal ferrite particles having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide, wherein the particles have a specific Curie temperature (T_c) in the polymer material,

(d) forming the polymeric material,

(e) applying an alternating magnetic field to the polymeric material,

(f) heating the ferromagnetic particles and heating the polymeric material with hysteresis losses from the ferromagnetic particles,

(g) continuing the applying of the alternating field and

(h) ceasing heating of ferromagnetic particles when the ferromagnetic particles reach Curie temperature.

70. The method of claim 69, wherein the applying comprises applying an alternating magnetic field at about 500 KHz - 10 MHz.

71. The method of claim 69, further comprising varying the amount of zinc in the ferromagnetic particle as to control the Curie temperature of the particles.

72. The method of claim 69, wherein Me_a comprises Mg, Co, Mn or Zn and Me_b comprises Ni, Co, Mn, or Zn.

73. The method of claim 69, wherein the particles comprise SrF, Co-2Y, Mg-2Y, Zn/Co-2Y, or Zn/Mg-2Y or combinations thereof, (Mn, ZnO)Fe_2O_3 or (Ni, ZnO)Fe_2O_3.

74. A susceptor for inclusion in a matrix for heating the matrix to a desired Curie temperature comprising a ferromagnetic hexagonal ferrite particle having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide.

75. The susceptor of claim 74, wherein the Curie temperature is changed by varying proportions of zinc in the composition.

76. The susceptor of claim 74, wherein Me_a comprises Mg, Co, Mn or Zn and Me_b comprises Ni, Co, Mn, or Zn.

77. The susceptor of claim 74, wherein the particles comprise SrF, Co-2Y, Mg-2Y, Zn/Co-2Y, or Zn/Mg-2Y or combinations thereof, (Mn, ZnO)Fe_2O_3 or (Ni, ZnO)Fe_2O_3.

78. A composite comprising a matrix and a susceptor included in the matrix for heating the matrix to a desired Curie temperature, wherein the susceptor comprises ferromagnetic, hexagonal ferrite particles having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide.

79. The composite of claim 78, wherein the Curie temperature is changed by varying proportions of zinc in the composite.

80. The composite of claim 78, wherein the matrix comprises a thermoplastic material.

81. The composite of claim 80, wherein the thermoplastic material comprises PEEK, PEKK, PEI, PPS, PSU, PET, polyester, PA, PP, PE, PU, PPO, PC, or combinations thereof.

82. The composite of claim 78, wherein Me_a comprises Mg, Co, Mn or Zn and Me_b comprises Ni, Co, Mn, or Zn.

83. A bonding thermoplastic comprising ferromagnetic, hexagonal ferrite particles having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide.

84. The bonding thermoplastic of claim 83, wherein the matrix comprises PEEK, PEKK, PEI, PPS, PSU, PET, polyester, PA, PP, PE, PU, PPO and PC.

85. The bonding thermoplastic of claim 83, wherein the Curie temperature is changed by varying proportions of zinc in the composition.

86. The bonding thermoplastic of claim 83, wherein the particles are dispersed throughout matrix.

87. The bonding thermoplastic of claim 83, wherein the particles are dispersed on a surface of the matrix.

88. An apparatus for heating materials comprising
a heating element having a shaped polymeric matrix;

susceptors dispersed in the matrix, wherein the susceptors heat the element to a predetermined Curie temperature upon application of an alternating magnetic field, wherein the susceptors have the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide;

and an inductor for inducing the magnetic field.

89. The apparatus of claim 88, wherein the materials are liquids or solid foods.

90. The apparatus of claim 88, wherein the heating element is shaped to be used as cookware.

91. The apparatus of claim 88, further comprising a layer of a distinct material laminated to the shaped matrix.

92. The apparatus according to claim 88, wherein the inductor operates at a power between 1500 W-2300W.

93. The apparatus according to claim 88, wherein the inductor has a frequency of 88 kHz – 310 kHz.

94. A sealable apparatus comprising

a first element having a shaped matrix and having a rim;

a second element having an annular area for bonding to the rim of the first element, and

susceptors having the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide disposed in the rim of the first

element or in the annular area of the second element, for heating the rim or the annular area to a predetermined Curie temperature upon application of an alternating magnetic field, for bonding the first element and the second element together.

95. The apparatus of claim 94, wherein the susceptors are disposed in both the rim and the annular area.

96. The apparatus of claim 94, wherein the matrix comprises a thermoplastic material.

97. A method of manufacturing a heating apparatus comprising:

(a) providing a matrix resin,

(b) providing a susceptor that has a predetermined Curie temperature and has the composition SrF, Me_a-2W, Me_a-2Y, and Me_a-2Z, wherein 2W is $BaO{:}2Me_aO{:}8Fe_2O_3$, 2Y is $2(BaO{:}Me_aO{:}Fe_2O_3)$, and 2Z is $3BaO{:}2Me_aO{:}12Fe_2O_3$, and wherein Me_a is a divalent cation, or magnetically soft ferrite particles having the composition $1Me_bO{:}1Fe_2O_3$, where Me_bO is a transition metal oxide,

(c) compounding the resin with the susceptor, and

(d) forming the compound into the desired shape.

98. The method according to claim 97, further comprising preconditioning the apparatus to reach the desired temperature, wherein the preconditioning step comprises providing a magnetic field to the apparatus prior to use..

99. The method according to claim 97, wherein the susceptors have particular magnetic domains and the magnetic field orients the domains into a preferred orientation.

100. The method according to claim 97, wherein the compound is formed into the shape of a cup to hold a food or liquid.

101. The method according to claim 97, wherein the compound is shaped into a disc.